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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/032,606 | 10/19/2001 | Kevin R. Keegan | 89190.072901/DP-304631 | 8160 |

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| EXAMINER | |
|---|---|
| ALEJANDRO, RAYMOND | |
| **ART UNIT** | **PAPER NUMBER** |
| 1745 | |

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/032,606 | KEEGAN ET AL. | |
| | Examiner | Art Unit | |
| | Raymond Alejandro | 1745 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *04 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *3-15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/30/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

This office action is responsive to the amendment dated 02/04/04. The applicants have overcome certain 35 USC 112 rejections. Refer to the foregoing amendment for more details on applicants' rebuttal arguments. However, the instant claims (including newly added claim 16) are finally rejected as the 35 USC 102/103 rejection is herein maintained for the reasons of record:

### *Election/Restrictions*

1. This application contains claim 3-15 drawn to an invention nonelected with traverse in Papers 06/16/03 and 10/01/03. A complete reply to the final rejection must include cancelation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

### *Information Disclosure Statement*

2. The information disclosure statement (IDS) submitted on 10/30/03 was considered by the examiner.

### *Drawings*

3. The drawings were received on 02/04/04. These drawings are acceptable.

### *Specification*

4. The amendment filed 02/04/04 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the

original disclosure is as follows: a) (claim 1) the recitation "*wherein said flow area is generally non-parallel to the flow of said oxygen ions through said cell*"; b) (claim 16) the recitation "*wherein said area is generally perpendicular to the flow of said oxygen ions through said cell*". It is noted that the original disclosure does not provide support for setting forth in the instant claims such specific flow area spatial orientation with respect to the flow of oxygen ions. Throughout the specification, applicants simply disclosed that "*oxygen ions migrate through the electrolyte*" (refer to the specification at page 3, lines 20-22), "*The electrolyte is permeable to the $O^{-2}$ ions which pass through the electrolyte...*" (see specification at page 9, lines 18-20) and/or "*An added complexity is that the reformate and oxygen are flowing orthogonally to each other*" (refer to the specification at page 10, lines 13-14). Thus, it is asserted that the original disclosure (specification) fails to positively establish that the flow area is generally non-parallel and/or perpendicular to the flow of oxygen ions as instantly claimed.

Applicant is required to cancel the new matter in the reply to this Office Action.

### *Claim Rejections - 35 USC § 112*

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-2 and 16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed

invention. The added material which is not supported by the original disclosure is as follows: a) (claim 1) the recitation "*wherein said flow area is generally non-parallel to the flow of said oxygen ions through said cell*"; b) (claim 16) the recitation "*wherein said area is generally perpendicular to the flow of said oxygen ions through said cell*". It is noted that the original disclosure does not provide support for setting forth in the instant claims such specific flow area spatial orientation with respect to the flow of oxygen ions. Throughout the specification, applicants simply disclosed that "*oxygen ions migrate through the electrolyte*" (refer to the specification at page 3, lines 20-22), "*The electrolyte is permeable to the $O^{-2}$ ions which pass through the electrolyte...*" (see specification at page 9, lines 18-20) and/or "*An added complexity is that the reformate and oxygen are flowing orthogonally to each other*" (refer to the specification at page 10, lines 13-14). Thus, it is asserted that the original disclosure (specification) fails to positively establish that the flow area is generally non-parallel and/or perpendicular to the flow of oxygen ions as instantly claimed.

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-2 and 16 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Mieney et al 2002/0098400.

The present application is directed to a fuel cell wherein the disclosed inventive concept comprises the specific hydrogen pressure regulating feature. Other limitations include the fuel cell components.

With respect to claims 1-2:

Mieney et al teach a fuel cell comprising a fuel cell unit including a cathode; an anode and an electrolyte disposed between the cathode and the anode (CLAIM 2). The fuel cell is a solid oxide fuel cell (SECTION 0040). It is also disclosed that the fuel cell unit includes an inlet

and an outlet coupled to the fuel cell unit; a reducing gas supply supplying gas for actuating the actuator and for regulating gas to the fuel cell unit (CLAIM 1).

Mieney et al further describe disposing an electrochemical cell having the anode, the cathode and the electrolyte, disposing control valves having first opening with a reducing gas supply having variable pressure and a second opening in fluid communication therewith; disposing a flow of oxidant to the cathode(SECTION 0040); disposing the reducing gas in fluid communication with the anode; actuating an actuator in the control valve with the variable gas supply pressure, and regulating the flow of reducing gas to the electrochemical cell by varying the gas supply pressure and controlling the flow of the reducing gas being pumped to the anode for preventing anode oxidation; the reducing gas comprises hydrogen (SECTION 0040). *Therefore, the pressure of hydrogen is being regulated to control the power generated through electrochemical conversion by the fuel cell.*

**Figure 2** below illustrates an solid oxide electrochemical fuel cell in operation producing a current flow as shown by current flow arrows 60 and 60'. Oxidant gases, such as oxygen or air, can be introduced to the cathode side of the cell, flowing as illustrated by the oxidant flow arrows 64, 64' and 64". The reaction of the fuel and oxide ions, producing electrons (e-), which flow outside of the electrochemical cell 10 to the external circuit 70 and back to the cathode 50 (SECTION 0024). At the anode, the oxide ions react with a fuel, such as hydrogen which as introduced to the electrochemical cell 10 as illustrated by the fuel flow arrows 62, 62' and 62" (SECTION 0025). It is further disclosed that the electrolyte 40 conducts these oxides ions ($O^{-2}$) between the anode 30 and the cathode 50, maintaining an overall electrical charge balance. The cycle of flowing electrons (e-) from the anode 30 through the external circuit 70 to the cathode

50 creates electrical energy for harnessing (SECTION 0027). Mieney et al teach that an end cap 20 includes a surface 22 that is configured for disposal adjacent to the anode 30 to provide fuel distribution; and an interconnect 24 includes a first interconnect surface 26 which is configured adjacent to the cathode 50 to provide oxidant distribution (SECTION 0019). It is also disclosed that oxide ions flow through the electrolyte 40 (SECTION 0029 & 0020). *Therefore, considering that anode 30, cathode 50 and the solid electrolyte 40 each has a three dimension structure (volume or 3D), it is contended that fuel and oxidant distribution flow areas represented by reference numerals 66 (the fuel stream arrow), reference numeral 62, 62' and 62" (the fuel flow arrows), reference numeral 68 (the oxidant stream arrow) and reference numeral 64, 64' and 64" (the oxidant flow arrows), respectively, are generally* ***non-parallel and/or orthogonal (intersecting or lying at right angles or having perpendicular slopes or tangents at the point of intersection)*** *to the flow of oxygen ions ($O^{-2}$) through the electrolyte 40 as illustrated below in Figure 2. In particular, fuel flow arrows 62, 62' and 62" and oxidant flow arrows 64, 64' and 64" are non-parallel to the oxygen ions flow; and fuel stream arrow 66 and oxidant stream arrow 68 are orthogonal to the flow of oxygen ions.*

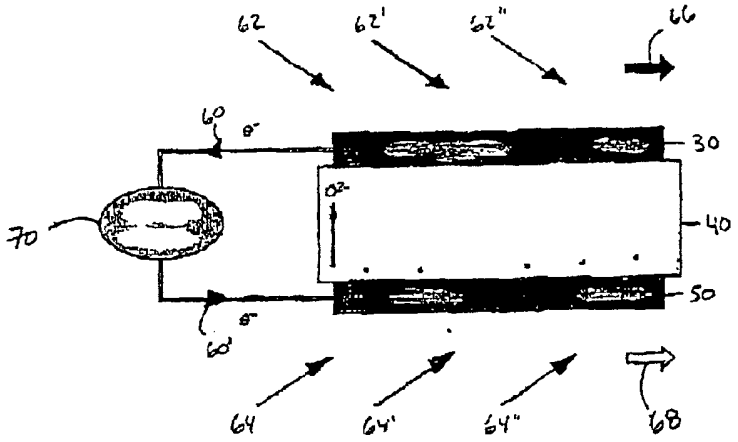


FIGURE 2

***Examiner's note:*** *As to the limitation that "resistance to the flow of electric current through the cell is non-uniform over a flow area of the cell" or "the electrical resistance is non-uniform over one of said anode, cathode or electrolyte", it is contended that the electrical resistance of any body is intrinsically related to the chemical nature of its construction material, therefore, since the construction material of each of the fuel cell components i.e. the anode, the cathode, the electrolyte, the separator; the end plate and the likes differs from one another, any fuel cell will exhibit non-uniform resistance to the flow of electric current through the cell over the areal extent thereof or over the anode, the cathode or the electrolyte. Accordingly, each fuel cell component presents a varied appearance of electrical resistance pattern due to its material composition. In addition, given that (as disclosed by the applicant, see specification at page 3, lines 17-22) the resistance is higher in areas of the cell having locally low levels of hydrogen than in areas having locally high levels of hydrogen, that is to say, the higher the concentration of hydrogen the lower the resistance is at a local fuel cell point/site, it is thus contended that hydrogen concentrations (level) inherently varies from the anode inlet to the anode active area and all over along the anode outlet, that is to say, the hydrogen concentration at a local anode point such as the inlet is different, due to hydrogen consumption or elimination, than the hydrogen concentration at another local anode point such as the outlet. This also applies to the cathode active area, including the inlet and the outlet but, of course, using oxygen instead of hydrogen as the flowing fluid. Thus, it is asserted that having shown that the construction material of each particular fuel cell component is chemically different from each other as well as a necessary variation or gradients in hydrogen concentration along the anode surface itself, the above-mentioned characteristic, property and/or function is hence inherent as the construction*

*material of fuel cell components (i.e. the solid oxide electrolyte) and the fuel cell structural configuration recited in the reference is substantially identical to that of the claims, and therefore, claimed properties, characteristics or functions are presumed to be inherent (**MPEP 2112. Requirements of Rejection Based on Inherency**). Thus, the prior art fuel cell seems to be identical except that the prior art is silent as to an inherent function, property and/or characteristic. In that, it is noted that the extrinsic evidence makes clear that the missing descriptive matter is necessarily present in fuel cell described in the reference, and that it would be so recognized by persons of ordinary skill.*

As to claim 16:

**Figure 2** above, in particular, shows fuel stream arrow 66 and oxidant stream arrow 68 which are orthogonal to the flow of oxygen ions.

Therefore, the claims are anticipated by Mieney et al. However, if the claims are not anticipated the claims are obvious as it has been held similar products claimed in terms of its function, property and/or characteristic are obvious. *In re Best 195 USPQ 430 and In re Fitzgerald 205 USPQ 594. See rationale and/or technical reason above to reasonably support the determination that the inherent function, property and/or characteristic necessarily flows from the teaching of the applied prior art.*

***Response to Arguments***

Applicant's arguments filed 02/04/04 have been fully considered but they are not persuasive. The assertion that the prior art of record does not teach or suggest the "fuel cell wherein the resistance to the flow of electric current through the cell is non-uniform over a flow

area, wherein the flow area is generally non-parallel or perpendicular to the flow of said oxygen ions through the cell" is respectfully disagreed with for the reasons below.

As explained above, **Figure 2** illustrates an solid oxide electrochemical fuel cell in operation producing a current flow as shown by current flow arrows 60 and 60'. Oxidant gases, such as oxygen or air, can be introduced to the cathode side of the cell, flowing as illustrated by the oxidant flow arrows 64, 64' and 64". The reaction of the fuel and oxide ions, producing electrons (e-), which flow outside of the electrochemical cell 10 to the external circuit 70 and back to the cathode 50 (SECTION 0024). At the anode, the oxide ions react with a fuel, such as hydrogen which as introduced to the electrochemical cell 10 as illustrated by the fuel flow arrows 62, 62' and 62" (SECTION 0025). It is further disclosed that the electrolyte 40 conducts these oxides ions ($O^{-2}$) between the anode 30 and the cathode 50, maintaining an overall electrical charge balance. The cycle of flowing electrons (e-) from the anode 30 through the external circuit 70 to the cathode 50 creates electrical energy for harnessing (SECTION 0027). Mieney et al teach that an end cap 20 includes a surface 22 that is configured for disposal adjacent to the anode 30 to provide fuel distribution; and an interconnect 24 includes a first interconnect surface 26 which is configured adjacent to the cathode 50 to provide oxidant distribution (SECTION 0019). It is also disclosed that oxide ions flow through the electrolyte 40 (SECTION 0029 & 0020). *Therefore, considering that anode 30, cathode 50 and the solid electrolyte 40 each has a three dimension structure (volume or 3D), it is contended that fuel and oxidant distribution flow areas represented by reference numerals 66 (the fuel stream arrow), reference numeral 62, 62' and 62" (the fuel flow arrows), reference numeral 68 (the oxidant stream arrow) and reference numeral 64, 64' and 64" (the oxidant flow arrows), respectively,*

*are generally non-parallel and/or orthogonal (intersecting or lying at right angles or having perpendicular slopes or tangents at the point of intersection) to the flow of oxygen ions ($O^{-2}$) through the electrolyte 40 as illustrated below in Figure 2. In particular, fuel flow arrows 62, 62' and 62" and oxidant flow arrows 64, 64' and 64" are non-parallel to the oxygen ions flow; and fuel stream arrow 66 and oxidant stream arrow 68 are orthogonal to the flow of oxygen ions.*

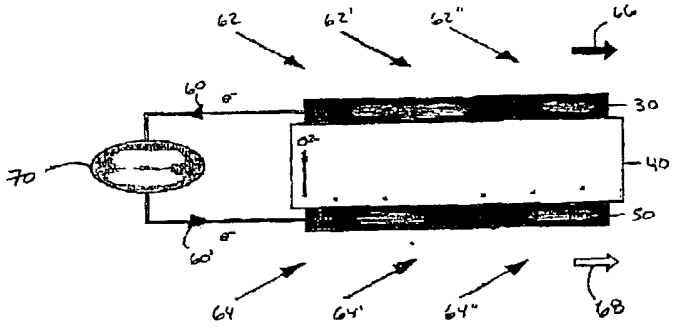


FIGURE 2

With respect to "*resistance to the flow of electric current through the cell is non-uniform over a flow area of the cell*" or "*the electrical resistance is non-uniform over one of said anode, cathode or electrolyte*", it is contended that the electrical resistance of any body is intrinsically related to the chemical nature of its construction material, therefore, since the construction material of each of the fuel cell components i.e. the anode, the cathode, the electrolyte, the separator; the end plate and the likes differs from one another, any fuel cell will exhibit non-uniform resistance to the flow of electric current through the cell over the areal extent thereof or over the anode, the cathode or the electrolyte. Accordingly, each fuel cell component presents a varied appearance of electrical resistance pattern due to its material composition. In addition, given that (as disclosed by the applicant, see specification at page 3, lines 17-22) the resistance is

higher in areas of the cell having locally low levels of hydrogen than in areas having locally high levels of hydrogen, that is to say, the higher the concentration of hydrogen the lower the resistance is at a local fuel cell point/site, it is thus contended that hydrogen concentrations (level) inherently varies from the anode inlet to the anode active area and all over along the anode outlet, that is to say, the hydrogen concentration at a local anode point such as the inlet is different, due to hydrogen consumption or elimination, than the hydrogen concentration at another local anode point such as the outlet. This also applies to the cathode active area, including the inlet and the outlet but, of course, using oxygen instead of hydrogen as the flowing fluid. Thus, it is asserted that having shown that the construction material of each particular fuel cell component is chemically different from each other as well as a necessary variation or gradients in hydrogen concentration along the electrode surfaces themselves, the above-mentioned characteristic, property and/or function is hence inherent as the construction material of fuel cell components (i.e. the solid oxide electrolyte) and the fuel cell structural configuration recited in the reference is substantially identical to that of the claims, and therefore, claimed properties, characteristics or functions are presumed to be inherent (**MPEP 2112. Requirements of Rejection Based on Inherency**). Thus, the prior art fuel cell seems to be identical except that the prior art is silent as to an inherent function, property and/or characteristic. In that, it is noted that the extrinsic evidence makes clear that the missing descriptive matter is necessarily present in fuel cell described in the reference, and that it would be so recognized by persons of ordinary skill.

***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro
Examiner
Art Unit 1745